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PATENT APPLICATION

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In re application of

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Satoshi AOKI, et al.

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For: CONTROL SYSTEM UTILIZING SERIAL COMMUNICATION

ARTICLE 34 AMENDMENTS

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Amendment

(Amendment Under the Provision of Patent Law, Article 11)

Sir Commissioner of the JPO

1. Indication for International Application: PCT/JP03/13007

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4. Date of Notification (date of mailing): June 29th, 2004

5. Subject Matters of Amendment

(1) Claims

(2) SPECIFICATION

6. Contents of Amendment

(1) Claims 1, 2, 3, 5, and 7 are amended as are in the attached paper.

(2) Claim 6 is deleted.

(3) The description, in p. 6, l. 16 to l. 22 in the original specification, i.e., “---, for determining whether or not the frame has been generated normally in the host control apparatus by checking the frame-error check data extracted by the extracting means, and for outputting to an apparatus to be controlled the emergency-stop data when the emergency-stop data is embedded in the serial-data communication frame and condition in which the frame is not generated normally in the host control apparatus is continued for a duration corresponding to a plurality of frames.” is amended to “---, for determining whether or not the frame has been generated normally in the host control apparatus by checking the frame-error check data extracted by the extracting means, for outputting to an apparatus to be controlled the emergency-stop data when the emergency-stop data is embedded in the serial-data communication frame and the frame is generated normally in the host control apparatus, for blocking output of the emergency-stop data to the apparatus to be controlled when the emergency-stop data is embedded in the serial-data communication frame and the frame is not generated normally in the host control apparatus, and for outputting to the apparatus to be controlled the emergency-stop data when condition in which the frame is not generated normally in the host control apparatus is continued for a duration corresponding to a plurality of frames.”

(4) The description, in p. 7, l. 12 to l. 19 in the original specification, i.e., “---, for determining whether or not the frame has been generated normally in the client control apparatus by checking the frame-error check data extracted by the extracting means, and for determining that the client control apparatus is out of order when the emergency-stop data is embedded in a serial-data communication frame and condition in which the frame is

not generated normally in the client control apparatus is continued for a duration corresponding to a plurality of frames.” is amended to “---, for determining whether or not the frame has been generated normally in the client control apparatus by checking the frame-error check data extracted by the extracting means, for determining that the client control apparatus is in order when the emergency-stop data is embedded in the serial-data communication frame and the frame is generated normally in the client control apparatus, and for determining that the client control apparatus is out of order when the emergency-stop data is embedded in the serial-data communication frame and condition in which the frame is not generated normally in the client control apparatus is continued for a duration corresponding to a plurality of frames.”

(5) The description, in p. 8, l. 12 to l. 20 in the original specification, i.e.; “---, determining whether or not the frame has been generated normally in the host control apparatus and/or the other client control apparatus by checking the frame-error check data extracted by the extracting means, and for outputting to an apparatus to be controlled the emergency-stop data when the emergency-stop data is embedded in the serial-data communication frame and condition in which the frame is not generated normally in the host control apparatus and/or the other client control apparatus is continued for a duration corresponding to a plurality of frames.” is amended to “---, for determining whether or not the frame has been generated normally in the host control apparatus and/or the other client control apparatus by checking the frame-error check data extracted by the extracting means, for outputting to an apparatus to be controlled the emergency-stop data when the emergency-stop data is embedded in the serial-data communication frame and the frame is generated normally in the host control apparatus and/or the other client control apparatus, for

blocking output of the emergency-stop data to the apparatus to be controlled when the emergency-stop data is embedded in the serial-data communication frame and the frame is not generated normally in the host control apparatus and/or the other client control apparatus, and for outputting to the apparatus to be controlled the emergency-stop data when condition in which the frame is not generated normally in the host control apparatus and/or the other client control apparatus is continued for a duration corresponding to a plurality of frames.”

(6) The description, in p. 10, l. 3 to p. 11, l. 15 in the original specification, i.e., “Still moreover, the present invention provides a control system utilizing serial-data communication, in which the serial-data communication between a host control apparatus and a plurality of client control apparatuses, or among the plurality of client control apparatuses is performed, the control system comprising: a means provided in the client control apparatus, for embedding emergency-stop data generated in the control apparatus when a malfunction occurs inside the one control apparatus and emergency-stop data generated in the other control apparatus in a serial-data communication frame to be outputted by the client control apparatus, for embedding predetermined frame-error check data in the serial-data communication frame to be outputted by the client control apparatus each time the serial-data communication frame is generated, and for outputting the frame to the client control apparatus and/or the other client control apparatus; an extracting means provided in the client control apparatus, for extracting the emergency-stop data and the frame-error check data from the frame that is transmitted from the host control apparatus, or the other client control apparatus, to the client control apparatus; and a means provided in the client control apparatus, for determining whether or not the frame has been generated normally in the host control apparatus or the other client control apparatus by checking the frame-error check data extracted by the extracting means, and for outputting to an apparatus to be controlled the emergency-stop data when emergency-stop data is embedded in the serial-data communication frame and condition in which the frame is not generated normally in the host

control apparatus or the other client control apparatus is continued for a duration corresponding to a plurality of frames.

Accordingly, it is possible to transmit emergency-stop data along with transmission data, such as a positional instruction, in serial data. The system determines that the client control apparatus is out of order when the emergency-stop data is embedded in a serial-data communication frame, and condition in which the frame is not generated normally in the host control apparatus and/or other client control apparatuses is continued for a duration corresponding to a plurality of frames. Therefore, the system does not inappropriately come to an emergency stop, whereby the reliability of an emergency stop can be enhanced.

In addition, even when the transmission data from a client control apparatus transmitting an emergency-stop signal becomes erroneous due to noise or the like, it is possible for other client control apparatuses to transmit the emergency-stop signal. Therefore, the reliability of emergency stop can be raised.” is deleted.

## CLAIMS

What is claimed is:

1. (after amendment) A control system utilizing serial-data communication, in which the serial-data communication between a host control apparatus and at least one client control apparatus is performed, the control system comprising:

a means provided in the host control apparatus, for embedding emergency-stop data in a serial-data communication frame when a malfunction occurs inside the host control apparatus, or when an emergency-stop signal is inputted to the host control apparatus, for embedding predetermined frame-error check data in the serial-data communication frame each time the serial-data communication frame is generated, and for outputting the frame to the client control apparatus;

an extracting means provided in the client control apparatus, for extracting the emergency-stop data and the frame-error check data from the frame that is transmitted from the host control apparatus to the client control apparatus; and

15 a means provided in the client control apparatus, for determining whether or not the frame has been generated normally in the host control apparatus by checking the frame-error check data extracted by the extracting means, for outputting to an apparatus to be controlled the emergency-stop data when the emergency-stop data is embedded in the serial-data communication frame and the frame is generated normally 20 in the host control apparatus, for blocking output of the emergency-stop data to the apparatus to be controlled when the emergency-stop data is embedded in the serial-data communication frame and the frame is not generated normally in the host control apparatus, and for outputting to the apparatus to be controlled the emergency-stop data when condition in which the frame is not generated normally in 25 the host control apparatus is continued for a duration corresponding to a plurality of

frames.

2. (after amendment) A control system utilizing serial-data communication, in which the serial-data communication between a host control apparatus and at least one client

5 control apparatus is performed, the control system comprising:

a means provided in the client control apparatus, for embedding emergency-stop data in a serial-data communication frame to be outputted by the client control apparatus when a malfunction occurs inside the client control apparatus, for embedding predetermined frame-error check data in the serial-data communication frame to be outputted by the client control apparatus each time the serial-data communication frame is generated, and for outputting the frame to the host control apparatus;

an extracting means provided in the host control apparatus, for extracting the emergency-stop data and the frame-error check data from the frame that is transmitted 15 from the client control apparatus to the host control apparatus; and

a means provided in the host control apparatus, for determining whether or not the frame has been generated normally in the client control apparatus by checking the frame-error check data extracted by the extracting means, for determining that the client control apparatus is in order when the emergency-stop data is embedded in the 20 serial-data communication frame and the frame is generated normally in the client control apparatus, and for determining that the client control apparatus is out of order when the emergency-stop data is embedded in the serial-data communication frame and condition in which the frame is not generated normally in the client control apparatus is continued for a duration corresponding to a plurality of frames.

3. (after amendment) A control system utilizing serial-data communication, in which the serial-data communication between a host control apparatus and a plurality of client control apparatuses, or among the plurality of client control apparatuses, is performed, the control system comprising:

5 a means provided in the client control apparatus, for embedding emergency-stop data in a serial-data communication frame to be outputted by the client control apparatus when a malfunction occurs inside of the client control apparatus or when an emergency-stop signal is inputted to the client control apparatus, for embedding predetermined frame-error check data in the serial-data communication  
10 frame to be outputted by the client control apparatus each time the serial-data communication frame is generated, and for outputting the frame to the host control apparatus and/or the other client control apparatus;

an extracting means provided in the client control apparatus, for extracting the emergency-stop data and the frame-error check data from the frame that is transmitted  
15 from the host control apparatus, and /or the other client control apparatus; and

a means provided in the client control apparatus, for determining whether or not the frame has been generated normally in the host control apparatus and/or the other client control apparatus by checking the frame-error check data extracted by the extracting means, for outputting to an apparatus to be controlled the emergency-stop  
20 data when the emergency-stop data is embedded in the serial-data communication frame and the frame is generated normally in the host control apparatus and/or the other client control apparatus, for blocking output of the emergency-stop data to the apparatus to be controlled when the emergency-stop data is embedded in the serial-data communication frame and the frame is not generated normally in the host  
25 control apparatus and/or the other client control apparatus, and for outputting to the

apparatus to be controlled the emergency-stop data when condition in which the frame is not generated normally in the host control apparatus and/or the other client control apparatus is continued for a duration corresponding to a plurality of frames.

5     4. The control system utilizing serial-data communication, according to any one of claim 1 through 3, wherein the means for embedding the frame-error check data in the frame generates the frame-error check data to which a specific numerical value is added each time the serial-data communication frame is generated when the frame is generated normally, and embeds the generated frame-error check data in the frame; 10 and wherein the means for determining compares previously received frame-error check data with presently received frame-error check data, and determines that the frame is not generated normally when a difference value between the previously received frame-error check data and the presently received frame-error check data is different from the specific numerical value.

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5. (after amendment) The control system utilizing serial-data communication according to any one of claim 1 through 3, in which the serial-data communication between the host control apparatus and the plurality of client control apparatuses, or among the plurality of client control apparatuses, is performed, the control system 20 comprising:

      a means provided in the client control apparatus, for embedding the emergency-stop data generated by the other client control apparatus in the frame to be outputted by the client control apparatus, and transmitting the frame to the host control apparatus and/or the other client control apparatus.

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6. (deleted)

7. (after amendment) The control system utilizing serial-data communication according to any one of claims 1 through 3, comprising:

5.        a counting unit provided in the host control apparatus and/or the client control apparatus, for counting the number of the received frames; and  
              a means provided in the host control apparatus and/or the client control apparatus, for outputting the emergency-stop signal in the case where a specific number of frames are not received.